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(54) Title: METHOD FOR FABRICATING SHOE INNER SOLES WITH ADAPTED FORM

(54) Bezeichnung: VERFAHREN ZUM HERSTELLEN VON SCHUHEINLEGE-SOHLEN MIT GENAUER PASSFORM

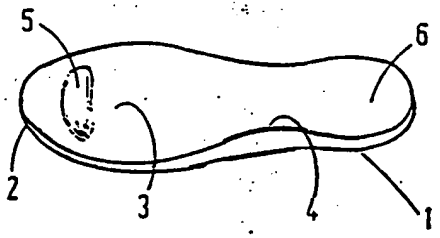
(57) Abstract

Method for manufacturing permanent inner soles for shoes, wherein a raw sole (10) is inserted into the shoe (9) and is individually adapted to the foot (11) when slipping on one's shoe. The raw sole (10) is comprised of a pasty, hardenable mass which subsequently remains elastic. Thermohardenable silicon rubber is preferably used. The thermohardening is carried out in a microwave oven (12). To cause the silicon rubber react to the microwaves, there is added to the material before the forming a transformation catalyst, for example flake graphite, soot, meal or gypsum.

(57) Zusammenfassung

Verfahren zum Herstellen von Dauereinlagen für Schuhe, bei welchem eine Rohsohle (10) in des Schuh (9) eingeführt und durch Anziehen des Schuhes dem Fuss (11) individuell angepasst wird. Die Rohsohle (10) besteht aus einer pastösen, aushärtbaren und nachträglich elastisch bleibenden Masse. Vorzugsweise wird ein warm aushärtender Silikon-Kautschuk verwendet. Die Warmaushärtung wird in einem Mikrowellenofen (12) durchgeführt. Damit der Silikon-Kautschuk auf die Mikrowellen reagiert, wird dem Werkstoff vor der Formung ein Umwandlungskatalysator zugesetzt, beispielsweise Flocken[illegible] Russ, Getreidemehl oder Gips.

FIG.1



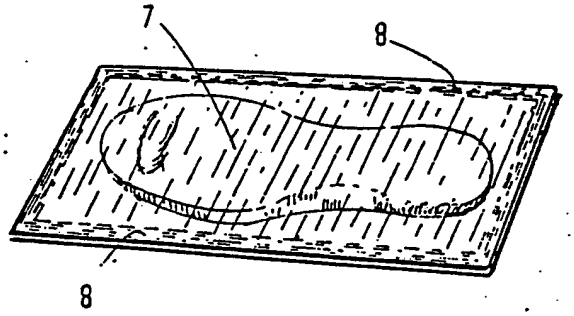


FIG.2

FIG.3

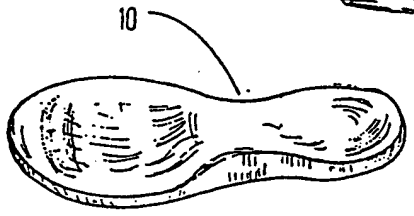
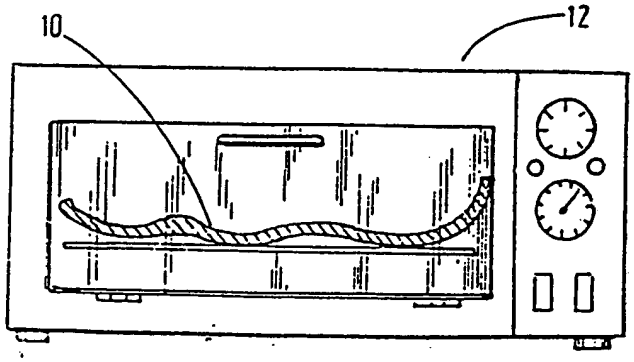


FIG.4

FIG.5



A Method for Fabricating Precisely Fitting Shoe Insoles

The method concerns a process for producing precisely fitting shoe insoles.

There is known to be a procedure for producing custom-made shoes by preparing a last for the shoe, modified according to the foot. However, the modification of a last according to the natural shape of the foot is a tedious process, and for the most part not sufficient for ensuring a precise fitting of the shoe to the actual shape of the foot.

Further, it is known how to insert shoe insoles into commerically made shoes or even custom-made shoes, in order to fit the shoe to the individual foot shapes particularly well. In this case simple soles, which correspond to the basic outline of the interior of the shoe, are inserted, it being possible to make these out of straw-plaiting, leather, plastic, or other suitable materials. Further, it is known how to produce and use so-called orthopedic shoe insoles, these being fitted to the shape of a healthy foot in a special way. For the most part they make use of a lift and, consequently, support in the middle part of the sole, as well as, in many cases, a special ridge, which serves to hold the toes. However, there is considerable difficulty in fitting a shoe insole of this type to the individual characteristics of the foot. According to the state-of-the-art

such fitting may be carried out only individually by work of the orthopedist, which is time-consuming and expensive, and therefore often left undone.

The task of the invention is to specify a process for producing shoe insoles, which in each case leads to soles optimally matched to the individual characteristics. The solution of this task is characterized by the following stages in the process:

a) Production of a pair of insoles with an approximate form from a plastic material, still elastic after hardening;

b) Inserting the soles into individually selected shoes and, in a given case, covering by means of fabric soles;

c) Stressing the insoles with the feet by means of putting on the shoes until the soles are precisely shaped to the feet;

d) Hardening the insoles by means of a cold or hot reaction.

The basic idea behind the process therefore consists in, first, preparing an insole with an approximate fit, but from a material which is plastic at first and which, after an individual fitting to the given foot shape, in each case may be hardened, after the hardening it being sufficiently elastic to serve as a sole material. An insole produced by such a method then is inserted

into individually selected shoes, therefore, for example, new or used street shoes, sports shoes, or the like, and, in a given, covered with a fabric sole, a paper sole, or the like. The covering serves only for the purpose of separating the foot from the sole material which has not yet undergone a reaction. The sole material is stressed by means of inserting the foot, and in a short time (in a few minutes) it adapts itself to all individual shapes of the foot precisely. When this condition is reached, the shoe may be removed and the insole present may be hardened by a cold or hot reaction. In this case the sole retains its shape so as to produce the desired optimal fit.

If a cold-hardening material is chosen as the sole material, it is not even necessary to remove the shoe. After just a few minutes, the material has acquired sufficient firmness, while retaining its elasticity properties. However, the disadvantage in the case of cold-hardening materials is that the entire process has to be carried out shortly before trying on the shoe, in particular, the approximately filled initial sole has to be produced shortly before this since the cold-hardening material always is a two-component material and the hardening reaction begins as soon as the components are combined. However, if a hot hardening material is chosen, the approximately filled insoles may be produced even for stock, so that the process may be carried out in a particularly economical way.

In the case of using hot-hardening materials, the approximately filled insoles may be produced as follows:

a) Producing a model with an excess on the raised parts and a deficiency on the flat parts;

b) Molding this model with thermoplastic, deep-drawing sheeting;

c) Putting a warm-hardenable material, elastic after hardening, into the mold;

d) Covering the filled mold and packing the latter, for example in pairs, as well as keeping these semifinished products as merchandise.

Elastically hardening silicon rubber has proven itself to be particularly suited as a material for producing insoles. If this material is used, then it is possible to make the insoles with an approximate fit according to the procedure just described, for example, in the factory. In this case, as has been stated, it is possible to start with a model which has an excess on the raised areas and a shortage of material on the flat areas. This model then may be molded with thermoplastic deep drawing sheeting, for example polyethylene, according to which the sheeting mold is filled with hot-hardening silicon rubber and packaged in pairs. The package created, for example, may be delivered to the shoe

trade and there used as needed. When the need arises, the mold is opened, the raw sole is removed, inserted into the desired shoe, and molded in the way described and then hot hardened.

Different types of silicon rubber, as are described for example in French Patent 1 453 327, are recommended purely for example for carrying out the above-mentioned version of the process. Also, silicon elastomers, as are mentioned in German Auslegeschrift 24 43 531 and the manufacturing process described there, also may be used. The process is characterized by the fact that high viscosity diorganopolysiloxanes with at least 0.02 % by weight compounds, which have at least one nitrogen atom bonded directly to the silicon or via oxygen and at least one triorganosilyl group, no more than one triorganosilyl group being bonded directly to a nitrogen atom, and no more than one group capable of condensation being bonded to a silicon atom, and 4-40 % by weight hexaorganodisilazanes, are then mixed with 10-150 % by weight silicon dioxide with a surface of at least 50 m^2/g and, if necessary, water, and then after the formation of a homogeneous mixture, this mixture is freed of volatile components before the final molding.

In order to carry out the process invented it is particularly recommended to use a hot-hardening silicon rubber which is provided with an addition of flake graphite. A material of this type may be heated and hardened by means of microwave radiation,

therefore, for example, in a commercial microwave oven. The material should contain the above-mentioned flake graphite in amounts of 1-10 % by weight, preferably in amounts of 3-8 % by weight. The term "flake graphite" is to be understood as meaning a type of graphite which consists of more or less small flakes. It has been shown that graphite of this type is especially capable of absorbing radiated microwaves sufficiently and transferring the heat which thus arises to the plastic.

However, rust may be used instead of flake graphite. Finally, it has been shown that other substances also may be used as conversion catalysts for the microwave energy, for example, such substances as contain water in bound form, in particular those which are hygroscopic. Examples of substances of this type are flour (grain flour) as well as gypsum ($CaSO_4 \cdot 2H_2O$). These substances should be present in the mixture in amounts of 3-5 % by weight with respect to the amount of the silicon rubber.

The above-mentioned process is explained below with respect to the drawing and by means of a specific embodiment. The individual steps of the process are shown schematically in the drawing. Here:

Fig. 1 shows a simplified perspective representation of an orthopedic insole;

Fig. 2 shows a simplified perspective representation of the sheet packaging molded and filled with hot-hardening material;

Fig. 3 shows a simplified representation of a shoe with inserted sole and foot;

Fig. 4 shows a simplified perspective representation of the still raw insole shaped by the foot;

Fig. 5 shows a simplified representation of a microwave oven with an insole.

The blank of an orthopedic shoe insert serves as the initial product. A blank of this type is shown in Fig. 1 and is designated as a whole as 1. The blank (the model) consists of cork or leather, in a given case also of plastic. Then it is hand-worked and matched to the requirements of the process to be carried out here.

The reworking consists in rough working the thin parts, for example, the front part 2 as well as the front foot support 3 by means of a file, rasp, or the like, until a material thickness of approximately 1-2 mm is obtained. Other places, for example, the middle foot support 4 as well as the so-called toe grip 5, are modelled by means of a cold-hardening plastic putty. A further recess is provided in the heel area 6, all modellings basically

being within the framework of the usual and are only lightly coated.

The raw model thus obtained then is inserted into a heatable vacuum deep-drawing device and covered with a thermoplastic deep-drying sheeting. This sheeting is heated, being joined to the reworked raw model 1 in precise contours under the influence of its weight as well as the applied vacuum, and then the model is molded. After recooling, the raw model may be removed from the sheeting mold now formed unchanged, and used for producing further molds. The sheeting mold itself may be filled with an appropriate material, for example with a hot vulcanizing silicon rubber, which is pasty in the raw state. For example, Types LFC 3963/19 and LFC 3963/20 of the Gummiwerk Kraiburg in Waldkraiburg Company may be used. Before pouring into the sheeting mold, this material is mixed with a suitable flake graphite. For example, Types MFL 85/87, RFL 99/5, and NFL 90 of the Graphitwerk Kropfmühl Company are suitable. An addition of 4 % by weight graphite to the silicon paste ready for hardening has proven itself to be good. The sheeting mold is filled with this mixture by spatula, in a given case covered with a separating material, for example, waxed paper or the like, and then two such molds (corresponding to a pair of insoles) are laid together head to head as is shown in Fig. 2. The mold formed from the raw model is shown as 7 in Fig. 2. The thermoplastic deep-drawing sheet covers this mold on all sides and forms a border 8. The

semifinished product packed in this way is suited for being stored in shoe shops as semifinished product.

When it is to be used, the package shown in Fig. 2 is opened and the material (two raw molds) formed in the mold 7 are removed. The raw molds now are inserted into a shoe 9 (see Fig. 3). They are shown as 10 in Fig. 3. Then the shoe is put on and stressed by the foot 11. In this case all individually given contours are molded cleanly, the excess and deficiencies produced in the raw mold being equalized by displacement of the material. The stressing is to be maintained for around 3-5 minutes, it being advantageous to move the foot back and forth slightly. After this time the shoe is removed, the raw mold 10 is removed, which is indicated symbolically in the drawing in Fig. 4. The mold stability of the above-mentioned materials is sufficient to be able to shape the raw mold in the way described. Then it is immediately placed in a microwave oven and hardened, depending upon the composition of the material, at temperatures of approximately 85°C. After this time the microwave oven is switched off and the finished shoe insert removed.

The process described is suited for use for any types of shoes. It is particularly recommended in the case of a deformed foot, which has to be supported by an individually shaped sole in the orthopedically correct way. However, it also may be used with advantage in the case of sports shoes and, in particular,

supports height performance athletes advantageously.

Patent Claims

1. A process for producing precisely fitting shoe insoles, characterized by the following stages in the process:

a) producing a pair of approximately fitting insoles made of a plastic hardenable material, also elastic after the hardening;

b) insertion of the soles into individually desired shoes and, in a given case, covered by means of fabric soles;

c) stressing the insoles with the feet by means of putting on the shoes until the soles precisely conform to the feet;

d) hardening the insoles by means of cold or hot reactions.

2. A process in accordance with Claim 1, characterized by the fact that the insoles are produced with an approximate fit as follows:

a) producing a model with an excess at the raised places and a deficit on the flat places;

b) molding this model with thermoplastic deep-drying sheeting;

c) pouring a warm hardenable material, elastic after hardening,

into the molds;

d) covering the filled mold, in a given case in pairs, and storing as merchandise.

3. A process in accordance with Claim 1 or 2, characterized by the fact that elastically hardening silicon rubber is used as the material for producing the insoles.

4. A process in accordance with Claim 3, characterized by the fact that elastically hardening silicon rubber with an addition of flake graphite is used as the material for producing the insoles by means of heat treatment, and the heat treatment is carried out by means of microwave radiation.

5. A process in accordance with Claim 4, characterized by the fact that the material contains 1-10 % by weight so-called flake graphite.

6. A process in accordance with Claim 5, characterized by the fact that the material contains 3-8 % by weight so-called flake graphite.

7. A process in accordance with Claim 1 or 2, characterized by the fact that a cold- or warm-hardening two-component material which remains elastic is used.

8. A process in accordance with Claim 1 or 2, characterized by the fact that the silicon rubber is provided with an addition of a material which contains water in chemically-bound form.

9. A process in accordance with Claim 8, characterized by the fact that the additive is hygroscopic.

10. A process in accordance with Claim 8 or 9, characterized by the fact that the silicon rubber contains 1-10 % by weight, preferably 3-5 % by weight, of the additive.

11. A process in accordance with Claim 8, characterized by the fact that the additive is flour (grain flour.)

12. A process in accordance with Claim 8, characterized by the fact that the additive is gypsum.

REVISED CLAIMS

[submitted to the International Office on 12 August 1985 (12.08.85); original Claims 1-12 replaced by new Claims 1-5 (2 sheets)]

1. A process for producing precisely fitting shoe insoles from a heat-hardening material, which also remains elastic after the hardening, characterized by the following steps in the process:

a) producing a model of the insole with an excess on the raised places and a deficit on the flat places;

b) molding this model with thermoplastic deep-drawing sheeting;

c) pouring a hot-hardening material remaining elastic after the hardening, into the mold obtained in Step (b);

d) covering the filled mold and packing the same, in a given case in pairs, as well as storing the semifinished products as merchandise;

e) inserting the semifinished product removed from the mold into individually desired shoes, and, in a given case, covering with fabric soles;

f) stressing the insoles with the feet by means of putting on the

shoes until exact fitting of the soles to the feet is obtained;

g) hardening the insoles by heat reaction.

2. A process in accordance with Claim 1, characterized by the fact that elastically hardening silicon rubber with an addition of 1-10 % by weight flake graphite is used as material for producing the insoles and the heat treatment is carried out by means of microwave radiation.

3. A process in accordance with Claim 1, characterized by the fact that elastically hardening silicon rubber with an addition of 1-10 % by weight of a material which contains water in chemically bound form is used as material for producing the insoles.

4. A process in accordance with Claim 3, characterized by the fact that the additive is grain flour.

5. A process in accordance with Claim 3, characterized by the fact that the additive is gypsum.

Attachment: Figs. 1-5.